Further, Ghannam testified that the gun's "slide and frame" could not be tested because she believed that it had five contributors, so it was also reasonable to suspect that at least five people had touched other places on the gun. (6T 42-12 to 24) Yet, Ghannam said she only found four contributors on the swabs from the "grip," "trigger," and "magazine." (6T 41-20 to 43-10, 84-14 to 16) Thus, L.B. needed an expert testimony to explain to the court that Ghannam's mixed results could be an indicator that she incorrectly counted the number of contributors on the gun's DNA swabs, causing the STRmix software to produce inaccurate results.

Because Ghannam was more likely to perform poorly when more potential contributors are present; there was evidence showing that up to five contributors were present on the gun; and she admitted that her only other testimony at a prior trial about her findings using STRmix involved a smaller mixture, (6T 11-6 to 9, 14-20 to 25) there was a serious chance of error here that needed to be properly explored by L.B.'s expert.

Second, L.B.'s DNA expert was necessary to demonstrate that, contrary to Ghannam's incorrect assertion, the issue of whether complex DNA mixtures are suitable to be tested at all, and if so, whether probabilistic software programs like STRmix

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about the likelihood that she determined the incorrect number of contributors to the DNA sample.

should be used to analyze them, is actually a quite controversial subject in the scientific community. (6T 56-23 to 57-4) As recently as 2014, Dr. Hannah Kelly, along with the creators of STRmix, acknowledged that: "there is no consensus within the forensic biology community as to how [complex mixtures and small DNA samples] should be interpreted." Kelly, 54-1 J. of Sci. at 66 (Ja 119) (emphasis added). And still, there remains "no agreement within the scientific community about which, if any, probabilistic software programs or methods to employ when analyzing low template DNA or complex mixture samples." Bess Stiffelman, No Longer the Gold Standard: Probabilistic Genotyping is Changing the Nature of DNA Evidence in Criminal Trial, 24 Berkeley J. Crim. L. 110, 122-23 n. 28 (2019). If L.B.'s counsel had properly been permitted to explore this issue, she could have made clear to the court that Ghannam's conclusions were not reliable.

Third, a defense DNA expert could have revealed that, although STRmix's code has remained a secret, at least three coding errors have been discovered. Two errors were found by Australian courts, one of the first countries where the software was implemented. Paula Reed Ward, Legal Question: How Do You Cross-Examine a Computer?, Pittsburg Post-Gazette (Aug. 29,

2016);[11] R v. Pfennig, (No. 2) [2016], SASC 171, at ¶¶ 270-75 (Ja 14-101).[12] Although STRmix's creators now acknowledge the errors, they were only discovered after prosecutors attempted to rely on their software in trials. Katherine Kwong, The Algorithm Says You Did It: The Use of Black Box Algorithms to Analyze Complex DNA Evidence, 31 Harv. J.L. & Tech. 275, 292 (2017). In 2014, a third error was found which was determined to have had "negatively affected the functioning of the software." Washington v. Fair, No. 10-1-09274-5 SEA (King County, WA, Superior Court) (Ja 102-111).

It is alarming that STRmix's source code errors were never mentioned during L.B.'s trial. Since the errors were discovered in 2014 and 2016, Ghannam should have known about them, and they could have impacted the validity of her expert opinion. Because she did not testify to taking any steps to correct these errors, she either chose refrain from using the precautions to prevent them from impacting her results, or was not following scientific discourse closely enough to know about errors in the first place. Either would seriously undermine her credibility. Without access to an expert for guidance, L.B.'s counsel had no reason

[11] Available at: https://www.post-gazette.com/news/science/2016/08/29/Legal-question-how-do-you-cross-examine-a-computer/stories/201608280021.

[12] Available at: http://www.austlii.edu.au/cgi-bin/viewdoc/au/cases/sa/SASC/2016/171.html.

to know of STRmix's coding flaws and properly question Ghannam about them.

In sum, it was error for the judge to allow the prosecution to present this DNA evidence unchallenged. This was not the traditional DNA case where the State's expert relied on well-established methods to conduct its analysis. The STRmix software is a complete black box and is so complex that Ghannam testified that even she did not know exactly how the program computes the statistic. (6T 55-16 to 23) As such, L.B.'s request to consult with its own DNA expert was not only guaranteed by his right to effectively confront the State's witnesses and present a complete defense, but it was necessary for a "full disclosure of all the facts." Garcia, 195 N.J. at 202. L.B.'s DNA expert could have rebutted Ghannam's incorrect testimony about the merits of contributor-counting and the forensic scientist community's attitude toward the analysis of complex mixtures. Further, the omission of L.B's expert was especially harmful because without the DNA evidence, the State's case was entirely circumstantial. Because the court's refusal to delay the start of trial so that L.B.'s DNA expert could prepare deprived L.B. of his rights to due process, a fair trial, the opportunity to cross-examine the witness against him, and to present witnesses in his own defense, the truth-seeking process in this case cannot be trusted and reversal is required.

**B. Alternatively, this Court Should Remand for a Frye Hearing to Determine Whether the STRmix Software is Reliable.**

Although L.B.'s counsel did not request a Frye hearing pre-trial, she explained that she would have, but that she was "incapable of making a challenge," because she "did not have the ability to access an expert who could analyze the validation studies, who could analyze the data with me and tell me exactly what I was looking for. I am not trained in DNA; I am not a scientist in this area. I do not know the answers to these questions." (6T 16-14 to 20) Thus, at a minimum, this Court should remand for a Frye hearing to permit L.B. to rely on expert to challenge whether the software used to procure his conviction was reliable. U.S. Const. amends. V, VI, XIV; N.J. Const. art. I, ¶ 1, 9, 10.

Our Rules of Evidence allow for the presentation of expert knowledge in certain, limited circumstances. N.J.R.E. 702 provides:

> If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education may testify thereto in the form of an opinion or otherwise.

In order for evidence to be admissible under N.J.R.E. 702, "the expert must utilize a technique or analysis with 'a sufficient scientific basis to produce uniform and reasonably reliable

results so as to contribute materially to the ascertainment of the truth.'" State v. J.R., 227 N.J. 393, 409 (2017) (quoting State v. Kelly, 97 N.J. 178, 210 (1984)); see also State v. Moore, 188 N.J. 182, 206 (2006) (scientific theories accepted as reliable when "based on a sound, adequately-founded scientific methodology involving data and information of the type reasonably relied on by experts in the scientific field") (citation and quotations omitted); Landrigan v. Celotex Corp., 127 N.J. 404, 417 (1992) (to qualify as scientific knowledge expert must be able to "demonstrate that both the factual bases and the methodology are scientifically reliable").

The admission of unreliable expert evidence poses significant danger to the fairness of our criminal justice system. State v. Cavallo, 88 N.J. 508, 518 (1982). As such, Rule 702 and due process prohibit the admission of unreliable expert testimony. Ibid. At this time, no New Jersey court has determined the reliability of this novel software pursuant to Frye. For all the reasons discussed in Point I, STRmix's reliability is uncertain and must be carefully scrutinized in order to preserve the truth-seeking process in this case.

## CONCLUSION

As explained in Point I, the court's refusal to grant the juvenile's expert additional time to prepare for trial denied him a meaningful opportunity to challenge the State's DNA expert's reliance on a novel and complex probabilistic genotyping software program, and thus, reversal is required. As explained in Point II, reversal is also required due to the admission of erroneous expert opinion on the juvenile's state of mind. Alternatively, for the reasons stated in Point III, the juvenile's disposition is excessive, and thus, should be vacated and remanded for resentencing.

Respectfully submitted,

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